

WEEDS AND WEED CONTROL IN QUEENSLAND

Reviewed by
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The State of Queensland is 667,000 square miles in extent, sitting astride the Tropic of Capricorn and extending over 19 degrees of latitude from 10 to 29°S. Temperature regimes range from warm temperate to warm tropical. Average annual rainfall ranges from less than 5" to more than 150". The rain falls mainly in the summer but in the southern half of the State and the very wet tropical coast there is also a significant but highly variable winter component. Soils range from infertile sands and podsols to fertile black earths and red earths.

LAND USE

Important agricultural crops include perennials such as sugar cane (the major agricultural crop of the state) and lucerne, summer-growing annuals such as sorghums, tobacco, cotton and peanuts and winter crops such as wheat, linseed and safflower.

Horticultural crops are remarkably varied and include bananas, pineapples, papaws, passion fruit, mangoes, citrus, stone fruits and pome fruits. Other crops such as potatoes, onions, tomatoes, beans peas, lettuce, carrots, cucurbits, cabbage, and other crucifers are also grown in fair amount. Special crops such as ginger and avocados are produced on a limited scale.

The greatest part of the State is devoted to grazing. Of the total area of about 560,000 square miles of grazing land, only about 1% carries sown pasture, the remainder depending entirely on native grasses and forbs, growth of which has been encouraged in some areas by destruction of the original tree vegetation. These native pastures are used almost exclusively for beef cattle and wool sheep. Sown pastures are used for dairy cattle and meat sheep as well as wool sheep and an increasing number of beef cattle.

WEED PROBLEMS

More than 350 plant species have been recorded as weeds in Queensland, that is, plants growing in situations where they are not wanted. They belong to a multitude of plant families, have come from many parts of the world and represent almost every kind of life-form from parasites through annual and perennial grasses and herbs to shrubs and trees.

The wide range of soils and climatic regimes, the variable patterns of land use and the large number of plant species combine to make the study, planning and practice of weed control in the State a problem of great complexity. This problem is further complicated by the great variability and unreliability of rainfall from year to year.

It is convenient to consider the weeds of Queensland under four headings, based mainly on land use.

1. Weeds of cultivated land
2. Weeds of sown pasture
3. Weeds in native pasture
4. Weeds of waste places

1. Weeds of Cultivation

Weeds of agricultural and horticultural crops fit mainly into this category. In annual crops and intensively farmed perennial crops most of them are kept under control by the tillage necessary to prepare the land for cropping or by inter-row cultivation. The most troublesome ones are either those that are capable of germinating with or slightly later than the crop or deep-rooted perennials not destroyed by tillage.

The most important examples in Queensland are wild oats (chiefly *Avena ludoviciana* with some *A. Fatua*), Cruciferous weeds such as turnip-weed (*Rapistrum rugosum*) wild radish (*Raphanus raphanistrum*), climbing buckwheat, (*Polygonum convolvulus*), bindweed (*Convolvulus erubescens*), black pigweed (*Trianthema portulacastrum*), New Zealand spinach (*Tetragonia tetragonooides*), Mexican poppies (*Argemone* spp.) mintweed (*Salvia reflexa*) and nut grass (mainly *Cyperus rotundus*) in annual crops, billy-goat weeds (*Ageratum* spp.) and vine weeds such as morning glories (*Ipomoea* spp.), passion-flowers (*Passiflora* spp.) and giant sensitive plant (*Mimosa invisa*) in sugar cane and feather-top Rhodes grass (*Chloris virgata*) in lucerne.

Phenoxy herbicides such as 2,4-D are widely used for the control of broad-leaf weeds in cereals but after more than 20 years of this treatment, grassy weeds such as wild oats and fairly resistant broad-leaf weeds such as climbing buckwheat and New Zealand spinach have now become weeds of major importance in these crops, at least in some seasons. Rawson puts the area infested with wild oats as 1,000,000 acres. For these weeds which are resistant to phenoxy herbicides it has been necessary to devise special techniques or to find new herbicides. With most of them, this can be done, although it increases the cost of weed control.

Because of the great seasonal variability in rainfall, both in amount and incidence, in many parts of the State, the spectrum of annual weeds often changes from year to year and it is often impossible to forecast the nature of the weed problem before the season begins. This makes difficult the planning of both research and control measures.

Many horticultural crops suffer from this same variability in the spectrum of weeds and most herbicides, particularly pre-emergence herbicides, have too narrow a spectrum of activity to be completely effective when used alone. As Gage points out in his paper, these situations can often be dealt with by using two or more pre-emergence herbicides in combination.

2. Weeds of Sown Pasture

Two main types of weeds may be troublesome in sown pasture land:

- (a) those that become aggressive when fertility is high, either the initial fertility on newly cleared land or increased fertility brought about by application of fertilizer or the growing of leguminous pasture plants.
- (b) those that become aggressive when fertility is declining.

(a) The former type have much in common with the weeds of cultivation and in fact are often the same species as those found on headlands or fallows in cultivated fields. They include plants like thistles and wild tobacco (*Solanum mauritianum*).

Weeds of this type also appear frequently on newly cleared scrub or rainforest country where destruction of trees and burning of trash releases large amounts of nutrients and makes available adequate soil moisture for vigorous growth. In these pioneering situations, they usually disappear after a few years under pasture when fertility begins to decline.

In addition to naturalized plants, native components of the original vegetation can be troublesome in situations of high fertility. Notable among these are brigalow (*Acacia harpophylla*) and many of the native plants associated with it such as malvastrum (*Malvastrum spicatum*) and flannel weeds (*Abutilon* spp.).

In Eucalyptus forest and woodland which is cleared, ringbarked or treated with herbicides and then sown to legumes such as Townsville stylo or siratro the initial fertility is not high. Even so, regrowth of the Eucalypts themselves can be a major problem unless the original treatment is such that it kills roots as well as the tops of the trees.

The establishment of tropical pastures in high rainfall areas has much in common with brigalow development except that the

plants which are serious competitors for the new pasture in the early years are more commonly naturalized species such as wild tobacco, lantana, knobweed (*Hyptis capitata*) and hyptis (*Hyptis suaveolens*) than native components of the climax vegetation. However short lived native woody species such as *Acacia flavescens* can be troublesome in some areas of north Queensland.

(b) Some of the most important weeds of dairy pastures in the State are on lands of declining fertility, particularly on rainforest country cleared 30 to 50 years ago, sown at that time with sward-forming grasses such as paspalum (*Paspalum dilatatum*) and continuously grazed ever since with little or no fertilizer being added or pasture renovation attempted.

These weeds include mat grass or narrow-leaf carpet grass, (*Axonopus affinis*), bracken (*Pteridium esculentum*), blady grass (*Imperata cylindrica* var. *major*), lantana (*Lantana camara*) and groundsel-bush (*Baccharis halimifolia*). In some moist, shady situations in south-eastern Queensland, crofton weed (*Eupatorium adenophorum*) and mist flower (*E. riparium*) have also become troublesome on this country, largely because they are difficult and costly to control by mechanical or chemical methods.

Methods used for controlling these weeds vary from chopping, slashing or poisoning to ploughing, fertilizing and sowing new pasture. Biological control by insects is proceeding on weeds such as groundsel-bush, lantana and crofton weed, but has not yet made them unimportant.

Much of the effort devoted to mechanical and chemical control of weeds in this group has obviously been misdirected, since it has been concentrated on killing the weeds rather than on seeking to change the cause of infestation.

This tendency to treat effects rather than causes stems in part from lack of appreciation of the basic reasons for their increase and in part from the fact that many of these plants have been declared noxious and therefore there is a legal obligation on every landholder to destroy them.

In this field a good deal more research, particularly ecological and agronomic research, is needed. More effective extension is also needed, aimed not only at the landholder but also at the financier and the administrator.

Many problems of controlling woody regrowth also fall into this category. Adequate research knowledge is available on the control of brigalow, and different techniques, including mechanical and chemical methods and fire, are called for in different situations. Injection of picloram preparations has made feasible the control of many thousands of acres of

Eucalyptus regrowth. However, a great deal of work is needed on other native woody plants which can invade either newly cleared and sown land or old established pastures on the same land. The principal species involved are sandalwood (*Eremophila mitchellii*), various species of *Eucalyptus* limebush (*Eremocitrus glauca*), yellow-wood (*Terminalia oblongata*) and *Melaleuca* spp. A fair amount of research effort by State and Commonwealth government agencies and by private industry is being directed to these problems.

3. Weeds of Native Pasture

The weeds of native pasture fall into two main groups:

- (a) native plants that are part of the original vegetation and are unpalatable, toxic or otherwise undesirable.
- (b) introduced plants which become naturalized in competition with native species under open range conditions.

(a) Examples of plants in the first category are galvanized burr (*Bassia birchii*), feather-top wire grass (*Aristida latifolia*), white spear grass (*Aristida leptopoda*), yabila grass (*Panicum queenslandicum*), Charleville turkey bush or blue turkey bush (*Eremophila gilesii*), fire bush (*Cassia pleurocarpa*) and, in sheep-raising districts, black spear grass (*Heteropogon contortus*). There is a fair body of knowledge about the behaviour of some of these but a great deal remains to be learnt about the factors that favour their periodic increase to pest proportions. It is already evident that for many species seasonal fluctuations are major controlling factors, although these seasonal effects may be influenced to some extent by land use.

(b) Exotic plants that can invade native pasture include noogoora burr (*Xanthium pungens*), the most widespread and probably the most economically important weed in Queensland, Harrisia cactus (*Eriocereus martinii*) which is costing the State a great deal of money, prickly pears (*Opuntia* spp.) most species of which are still under satisfactory biological control, Bathurst burr (*Xanthium spinosum*), rubber vine (*Cryptostegia grandiflora*) and chinee apple (*Ziziphus mauritiana*).

Attempts are made to enforce or encourage destruction of these, mainly by chemical means and for most of them knowledge of chemical control methods is available. However, in some cases the costs involved are greater than the expected short term returns and the chief justification for the expenditure involved is a fear of the long-term consequences of neglect.

4. Weeds of Waste Places

Weeds along railway lines, roadsides and transmission lines or on steep banks, cliffs, quarries, industrial sites and vacant town allotments represent a great variety of life form. Apart from plants which are troublesome in pastures or crops they include many species which either do not invade grazed or cultivated land or fail to persist in such situations. Some plants such as guinea grass are useful pasture grasses but objectionable on roadsides where they limit visibility very badly and invade adjoining sugar fields.

Methods of control vary according to the situation and the species involved. For industrial sites and railway rights of way, there is a steadily increasing use of total weedkillers, mainly mixtures of persistent herbicides. Transmission lines require control mainly of woody species and this is usually achieved by slashing and/or application of 2,4,5-T or picloram mixtures.

On roadsides, mowing or grading is the preferred method of control in most areas. This tends to encourage the development of plants that can persist under short cutting or produce seed at a low height such as grader grass (*Themeda quadrivalvis*), elastic grass (*Eragrostis tenuifolia*), gomphrena weed (*Gomphrena celosioides*), and Townsville stylo.

On vacant land, the desirability of treating weeds at all is often open to question unless they are in situations where they threaten useful land (such as groundsel bush) or are capable of harbouring pests, diseases or vermin that can attack adjoining crops.

Hay fever plants such as annual ragweed (*Ambrosia artemisiifolia*) which often grows on roadsides and on vacant land is one weed that has been attacked by Government and Local authorities to protect urban and rural populations.

REQUIREMENTS

It is obvious that the weed problems of Queensland are so diverse and so complex that many of the present methods of control are necessarily empirical. The number of full-time workers in weeds research is pitifully small in relation to the large area and great diversity of plants involved.

The number of research workers, both in Government agencies and in private industry, is increasing slowly but a great deal more remains to be done. It is becoming increasingly evident

that the best results flow from concentrated research on one or two species at a time rather than a 'recipe book' approach to a large number of species. The uncomfortable fact is that there are infinitely more troublesome species than there are workers to study them.

Extension could be improved but most extension workers are reasonably up to date with research findings and are doing the best they can. There is still some tendency towards writing prescriptions to deal with symptoms rather than training the landholder to think about the causes for his weed problems but much of this is due to lack of basic knowledge of the ecological factors involved.

Some rethinking of attitudes towards enforcement of weed control legislation is needed and there are welcome signs that such rethinking is gathering momentum. It has been recognized that plants may be noxious in some situations and either innocuous or even beneficial in others and the present practice of placing a legal obligation on landholders and public bodies simply to destroy declared noxious plants is recognized to be ecologically unsound in many cases.

A considerable amount of study has been directed toward the practicability of framing legislative and administrative procedures which will make it possible to enforce control where pressure is really needed and to withhold pressure when such action would be either ineffective or ecologically unwise. Any ideas as to how such legislation can be framed and administered would be very welcome at this Conference.

WEEDS OF AGRICULTURAL CROPS IN QUEENSLAND

Reviewed by

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THE SIGNIFICANCE OF WEEDS IN AGRICULTURAL CROPS

Many exotic weeds grow in Queensland, and most troublesome species are introduced. Few native plants are serious weeds in crops.

The most varied populations occur in early settled districts. There may be few recognised weeds in recently developed areas such as the Central Highlands.